

REMARKS

Claims 1-11, 14-17, 20-28 and 30-52 are pending in the present application. Claims 1, 15 and 30-39 have been amended, and claims 12, 13, 18, 19 and 29 have been cancelled in this response.

In the Office Action mailed November 24, 2004, claims 1-52 were rejected. More specifically, the status of the claims in light of this Office Action is as follows:

(A) Claims 1-8, 15-17, 23, 24, 26 and 29-31 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Application Publication No. 2004/0056195 to Kuhlman et al. ("Kuhlman");

(B) Claims 12, 13, 18, 19, 32 and 33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuhlman;

(C) Claims 9-11, 20-22, 25, 27 and 34-38 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuhlman in view of an article by Marcus et al. in Applied Physics Letters ("Marcus");

(D) Claims 14, 28, 39-47, 51 and 52 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuhlman in view of U.S. Patent No. 6,576,900 to Kelly et al. ("Kelly"); and

(E) Claims 48-50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuhlman, Kelly, and Marcus.

A. Response to the Section 102(e) Rejection

Claims 1-8, 15-17, 23, 24, 26 and 29-31 were rejected under 35 U.S.C. § 102(e) as being anticipated by Kuhlman. As described below, Kuhlman fails to disclose or suggest all of the features of these claims.

1. Claim 1 is Directed to a Method of Preparing a Sample for Atom Probe Analysis Including Directing Laser Energy Toward a Sample to Form a Projection and Reducing a Lateral Dimension of the Projection Without Laser Energy

Claim 1 is directed to a method of preparing a sample for atom probe analysis including (a) positioning a surface of the sample with respect to a laser source, and (b) directing laser energy from the laser source toward the surface to remove material from the sample and form a recessed surface and a projection of sample material projecting beyond the recess surface. The method further includes reducing the lateral dimension of at least a portion of the projection without laser energy to form a microtip having a reduced-dimension apex spaced from the recessed surface, and juxtaposing the microtip with an electrode of an atomic probe.

2. Kuhlman Discloses Methods of Preparing Samples for Atom Probes Including Forming a Plurality of Posts by Laser Ablation

Kuhlman discloses several methods of preparing samples for atom probes. The methods include cutting a flat slab 10 of material 16 with a saw or laser to form a plurality of posts 24. The individual posts 24 can be broken off the slab 10, mounted to corresponding pins 102, and subsequently milled to form a sharp tip. Alternatively, the posts 24 may not be broken off the slab 10, but rather the slab 10 may be cut to form a plurality of small squares 26, with each square 26 including several posts 24. The posts 24 on each square 26 are subsequently cut and properly sized for analysis. For example, the laser may cut cylindrical posts with rounded distal ends.

3. Kuhlman Fails to Disclose or Suggest Directing Laser Energy Toward a Surface of a Sample to Form a Projection and Reducing a Lateral Dimension of the Projection Without Laser Energy

Kuhlman fails to disclose or suggest a method of preparing a sample for atom probe analysis, including, *inter alia*, "directing laser energy from the laser source toward the surface to remove material from the sample . . . leaving a projection of sample material projecting beyond the recessed surface," and "reducing a lateral dimension of at least a portion of the projection projecting from the recessed surface without laser energy," as recited in claim 1. Although Kuhlman's methods include forming a plurality of posts with laser energy, the lateral dimension of Kuhlman's posts appears to be

either (a) not reduced, (b) reduced using laser energy, or (c) reduced by milling, but only after the posts have been detached from the slab 10 and mounted to corresponding pins 102. Kuhlman accordingly fails to disclose reducing a lateral dimension of the projection projecting from the recessed surface without laser energy. Therefore, the Section 102(e) rejection of claim 1 should be withdrawn.

Moreover, one skilled in the art would not be motivated to modify Kuhlman's methods to include the claimed combination of features. For example, in Kuhlman's method in which the lateral dimension of the posts is not reduced, one skilled in the art would not be motivated to add an additional processing step (reducing the lateral dimension of the posts without laser energy) to an already suitable process for manufacturing the posts. In Kuhlman's method in which the posts are formed and the lateral dimension reduced with laser energy, one skilled in the art would not be motivated to add an additional process and change Kuhlman's one-step method to a two-step method. In Kuhlman's method in which the posts are detached from the slab 10 and mounted to corresponding pins 102, one skilled in the art would not be motivated to form the sharp tips by milling the posts before detaching the posts from the slab because the milled posts are brittle and fragile. As such, detaching the milled posts from the slab may break the tip and/or another section of the posts. Consequently, one skilled in the art would not be motivated to modify Kuhlman's methods to include the claimed combination of features.

Claims 2-8 depend from claim 1. Accordingly, the Section 102(e) rejection of claims 2-8 should be withdrawn for the reasons discussed above with reference to claim 1 and for the additional features of these claims.

Independent claim 15 has, *inter alia*, features generally analogous to the features of claim 1. Accordingly, the Section 102(e) rejection of claim 15 should be withdrawn for the reasons discussed above with reference to claim 1 and for the additional features of this claim.

Claims 16, 17, 23, 24 and 26 depend from claim 15. Accordingly, the Section 102(e) rejection of these claims should be withdrawn for the reasons discussed above with reference to claim 15 and for the additional features of these claims.

Claim 29 has been cancelled in this response and therefore the rejection of this claim is now moot.

Claims 30 and 31 have been amended to depend from claim 39. Accordingly, the Section 102(e) rejection of claims 30 and 31 should be withdrawn for the reasons described below with reference to claim 39 and for the additional features of these claims.

B. Response to the Section 103(a) Rejection Over Kuhlman

Claims 12, 13, 18, 19, 32 and 33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuhlman. Claims 12, 13, 18 and 19 have been cancelled in this response and therefore the rejection of these claims is now moot. Claims 32 and 33 have been amended to depend from claim 39. Accordingly, the Section 103(a) rejection of claims 32 and 33 should be withdrawn for the reasons discussed below with reference to claim 39 and for the additional features of these claims.

C. Response to the Section 103(a) Rejection Over Kuhlman and Marcus

Claims 9-11, 20-22, 25, 27 and 34-38 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuhlman in view of Marcus. Claims 9-11 depend from claim 1; and claims 20-22, 25 and 27 depend from claim 15. Accordingly, claims 9-11, 20-22, 25 and 27 are patentable over Kuhlman for the reasons discussed above with reference to their respective independent claims and for the additional features of these claims. Marcus fails to cure the above-noted deficiency of Kuhlman to properly support a *prima facie* case of obviousness. For example, although Marcus discloses a method for forming a sharp tip on a protrusion of silicon, Marcus fails to provide a motivation for modifying Kuhlman's method to reduce the lateral dimension of the posts without laser energy. Therefore, the Section 103(a) rejection of claims 9-11, 20-22, 25 and 27 should be withdrawn.

Claims 34-38 have been amended to depend from claim 39. As described below with reference to claims 48-50, which also depend from claim 39, Marcus fails to cure the below-noted deficiencies of Kuhlman and Kelly to properly support a *prima facie* case of obviousness of claim 39. Accordingly, the Section 103(a) rejection of claims 34-38 should be withdrawn.

D. Response to the Section 103(a) Rejection Over Kuhlman and Kelly

Claims 14, 28, 39-47, 51 and 52 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuhlman and Kelly. As described below, the combination of Kuhlman and Kelly fails to disclose or suggest all of the features of the claims.

1. Claim 39 Is Directed to a Method of Analyzing a Portion of a Sample Including Inspecting a Surface of the Sample to Identify an Area of Interest and Juxtaposing an Apex of a Sample Column on the Sample With an Electrode of an Atom Probe

Claim 39 is directed to a method of analyzing a portion of a sample including inspecting a surface of the sample to identify an area of interest and selectively removing material from the sample using laser energy to define an array of sample columns. The sample columns include a first sample column at least proximate to the area of interest and a second sample column spaced apart from the first sample column. The method further includes providing the first sample column with a reduced-diameter first apex at its outward end and providing the second sample column with a reduced-diameter second apex at its outward end. The method further includes juxtaposing the first apex of the first sample column on the sample with an electrode of an atom probe, and controlling energy delivered to the first apex to selectively remove material from the first apex.

2. Kelly is Directed to a Method of Sampling Specimens Including Detaching a Study Specimen from a First Study Object and Placing the Study Specimen on a Second Study Object for Microanalysis

Kelly discloses a method of sampling specimens for atom probe microscopy including identifying an area of interest on a first study object, forming a study specimen on the larger first study object, removing the study specimen from the first study object, positioning the study specimen on a second study object, and microanalyzing the study

specimen. The second study object is "constructed and configured to enhance the speed and ease of microanalysis; for example, the second study object may be formed of a material which promotes electrostatic attraction of the study specimen to the second study object (either by itself or with the assistance of an applied charge), thereby assisting in the placement of the study specimen on the second study object." (Kelly, col. 4, Ins. 26-33.)

3. Kuhlman and Kelly Fail to Disclose or Suggest Analyzing a Portion of a Sample Including Juxtaposing a First Apex of a Sample Column on a Sample With an Electrode of an Atom Probe and Controlling Energy Delivered to the First Apex to Selectively Remove Material from the First Apex

The combination of Kuhlman and Kelly fails to disclose or suggest a method of analyzing a portion of a sample, including, *inter alia*, "juxtaposing the first apex of the first sample column on the sample with an electrode of an atom probe," and "with the first apex juxtaposed with the electrode, controlling energy delivered to the first apex to selectively remove material from the first apex," as recited in claim 39. For example, Kelly discloses detaching a study specimen from a first study object and placing the study specimen on a second study object for microanalysis by an atom probe. As such, Kelly does not juxtapose a portion of the study specimen on the first study object with an electrode. Rather, the portion of Kelly's study specimen is removed from the first study object before microanalysis. Moreover, one purpose of Kelly's invention is to use a second study object that is different than the first study object "to enhance the speed and ease of microanalysis." (Kelly, col. 4, Ins. 27 and 28.) As such, assuming for the sake of argument that Kelly's study specimen and first study object correspond to the projection and sample, respectively, of claim 39, Kelly specifically teaches away from analyzing the projection while it is attached to the sample as required by claim 39.

The law does not allow one reference to be modified to come up with the claimed combination of features when the reasoning for the modification contravenes an object of the invention disclosed in the prior art reference and ignores the portion of the reference that teaches away from making the claimed structure. To meet the burden of establishing a *prima facie* case of obviousness, "the Examiner must show

that there is either a suggestion in the art to produce the claimed invention or a compelling motivation based on sound scientific principles." *Ex parte Kranz*, 19 U.S.P.Q.2d 1216, 1218 (Bd. Pat. App. & Interf. 1991). To show such a suggestion, the Examiner must show that "the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." *In re Bell*, 26 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1993). Moreover, and importantly for the present appeal, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would teach away from the claimed invention. *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 U.S.P.Q. 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). This same standard is echoed in the MPEP § 2142:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

The MPEP goes on to explain that if the references do not "expressly or impliedly suggest the claimed invention," it is the Examiner's burden to "present a convincing line of reasoning" as to why the modification would have been obvious. *Id.* (quoting *Ex Parte Clapp*, 227 U.S.P.Q. 972, 973 (Bd. Pat. App. & Inter. 1985)). This line of reasoning must be more than vague conjecture about *possible* modifications of the prior art.

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. . . . Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so."

MPEP § 2143.01 (quoting *In re Mills*, 916 F.2d 680, 16 U.S.P.Q. 2d 1430 (Fed. Cir. 1990)).

The current rejection of claim 39 over the combination of Kuhlman and Kelly does not comply with Section 103 because one of ordinary skill in the art would not be motivated to combine Kuhlman and Kelly to come up with the claimed combination of features. As explained above, such a combination conflicts with Kelly's teachings and contravenes an object of Kelly's invention. Accordingly, the Section 103 rejection of claim 39 should be withdrawn.

Claim 14 depends from claim 1, and has, *inter alia*, features generally analogous to the features recited in claim 39. Accordingly, a Section 103(a) rejection of claim 14 should be withdrawn for the reasons discussed above with reference to claim 39 and for the additional features of claim 14.

Claim 28 depends from claim 15, and has, *inter alia*, features generally analogous to the features recited in claim 39. Accordingly, the Section 103(a) rejection of claim 28 should be withdrawn for the reasons discussed above with reference to claim 39 and for the additional features of claim 28.

Independent claim 40 has, *inter alia*, features generally analogous to claim 39. Accordingly, the Section 103(a) rejection of claim 40 should be withdrawn for the reasons discussed above with reference to claim 39 and for the additional features of claim 40.

Claims 41-47, 51 and 52 depend from claim 40. Accordingly, the Section 103(a) rejection of claims 41-47, 51 and 52 should be withdrawn for the reasons discussed above with reference to claim 40 and for the additional features of these claims.

E. Response to the Section 103(a) Rejection over Kuhlman, Kelly, and Marcus

Claims 48-50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuhlman, Kelly, and Marcus. Claims 48-50 depend from claim 40, and are patentable over Kuhlman and Kelly for the reasons discussed above with reference to claim 40 and for the additional features of these claims. Marcus fails to cure the above-noted deficiencies of Kelly and Kuhlman to properly support a *prima facie* case of obviousness with respect to claims 48-50. For example, Marcus fails to cure the lack of

motivation to combine Kuhlman and Kelly as described above. Accordingly, the Section 103(a) rejection of claims 48-50 should be withdrawn.

F. Conclusion

In view of the foregoing, the claims pending in the application comply with the requirements of 35 U.S.C. § 112 and patentably define over the applied art. A Notice of Allowance is, therefore, respectfully requested. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-6465.

Respectfully submitted,

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